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EFFECT OF PLYOMETRIC TRAINING AND RESISTANCE TRAINING ON THE DEVELOPMENT OF MOTOR FITNESS COMPONENTS AMONG ENGINEERING COLLEGE MEN STUDENTS

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Introduction

Sports training includes physiological changes in almost every system of the body particularly with the skeletal muscle and the cardio-respiratory system. The changes resulting from training are influenced by the frequency, duration and particularly by the intensity of training programme. The effects of training are specific to the type of exercise performed, the muscle group involved, and to the type of training programme used. The specificity of training and exercise has the two broad physiological bases, metabolic and neuromuscular.

Sports Training is a process of athletic improvement, which is conducted on basis of scientific principles through which systematic development of mental and physical efficiency, capacity and motivation enables athletes to produce outstanding and record breaking athletic performances.

Plyometric is derived from Latin word plyometrics is interpreted top mean "measurable increases" plyometrices refers to the exercise that enables a muscle to reach maximum strength in as short a time as possible. This speed strength is known as power. For many years coaches and athletes have sought to improve power in order to enhance performance. Throughout this century and no doubt long before jumping, bounding & hopping exercise have been used in various ways to enhance athletic performances.

Methodology

The purpose of the study was to find out the effect of plyometric training and resistance training on the development of motor fitness components. To achieve this purpose of the study,forty five engineering college students from University College of Engineering, Ariyalur were selected as subjects at random. The age of the subjects ranged from 18 to 21 years. The selected subjects were divided into three equal groups of fifteen subjects each Group I underwent plyometric training, Group II underwent resistance training,Group II act as control group.

The selected criterion variables were assessed using standard tests and procedures,before and after the training schedule. The instruments used for testing the dependent variables were standard and reliable as they were purchased from the reputed companies the variables and tests used are presented in table 1.

Table I
Criterion variables and Tests

SI. NO	Variables	Tests/Instruments	Unit of Measurements
1	Speed	50 meter dash	Stop watch
2	Explosive Power	Sargeant Vertical Jump	Centimeter
3	Cardio-Respiratory Endurance	Cooper's 12 Run/walk	Meters
4	Muscular Strength	Bent Knee sit-ups	Counts

Training Programme

During the training period the experimental groups underwent their Respective training program,three days per week (alternate days) for six weeks in addition to their regular programme to the course of study as per their curriculum.

Table – II
Exercise used in the plyometric Training Schedule

S.No	Exercise	First 2 weeks	2-3 weeks	3-4 weeks	4-6 weeks
		Phase			
		I	II	III	IV
1	Squat Jump*	2(10)	3(15)	3(15)	3(15)
2	Burper*	2(10)	3(10)	3(15)	3(15)
3	Combination	2(20m)	3(20)	3(15)	3(15)
4	Drop push up*	2(10)	3(10)	3(15)	3(15)

A phase consists of 3 weeks duration *number of sets followed by repetitions
**Number of sets followed by distances – Recovery: 5 to 10 sec of test between repletion and 2-3 min between sets

Table – III
Exercise used in the Resistance Training Schedule

S.No	Exercise	First 2 weeks	2-3 weeks	3-4 weeks	4-6 weeks
		Phase			
		I	II	III	IV
1	Half Squat	2(10)	3(15)	3(15)	3(15)
2	Leg press	2(10)	3(10)	3(15)	3(15)
3	Leg level	2(20m)	3(20)	3(15)	3(15)
4	Bench press	2(10)	3(10)	3(15)	3(15)

Volume: 2-3 sets of 8-12 repetition Recovery: 5-10 min between sets.

Experimental Design an statistical procedure

The Experimental design used for the present investigation was random group design involving forty five subjects for training for training effect. Analysis of co-variance (ANCOVA) was used as a statistical technique to determine the significant difference, if any existing between pre test and post test data on selected dependent variables. The level of significance was accepted at $p<0.05$.

Results and Discussion:

The age, height and weight of the selected subjects averaged 20.07±1.34 year, 168.3±4.12cm, and 63.7±3.57kg respectively. The descriptive analysis of data collected on selected motor fitness components before and after six weeks of plyometric and resistance training is presented in table IV,V,VI, and VII.

Table – IV
Computation of Analysis of co-variance on Speed

	Experimental Group–I (Plyometric)	Experimental Group–II (Resistance)	Control Group–III	Sources of variance	Sum of squares	Df	Mean squares	F-ratio
Pre-test mean	7.81	7.73	6.92	B: W:	1.27 12.07	2 43	.64 .21	3.05
Post-test mean	7.92	7.09	5.08	B: W:	2.22 11.01	2 43	1.11 .19	5.84
Adjusted post test mean	6.95	7.15	6.09	B: W:	4.85 8.40	2 42	1.03 .15	3.53

Table IV shows the analyzed data on speed, the pre-test, post test and adjusted post test means of speed were (7.81, 7.73, 6.92)(7.92, 7.09, 5.80) (6.95, 7.15, 6.09) for the experimental group I,II,& III respectively. The obtained `F` ratio for pre-test 3.05, post test 5.84, and adjusted post test 3.21. The table value is 3.15 at .5 level of significant for the degree of freedom (2 and 43 and 2 and 42) hence the obtained `F` ratio adjusted post test were greater than the table `F` ratio. Therefore it is proved those plyometric training groups have been better the other two groups.

Table – V
Computation of Analysis of co-variance on Explosive Power

	Experimental Group–I (Plyometric)	Experimental Group–II (Weight)	Control Group–III	Sources of variance	Sum of squares	Df	Mean squares	F-ratio
Pre-test mean	33.87	31.01	31.70	B: W:	1.98 141.01	2 43	133.5 3.27	2.95
Post-test mean	40.87	38.09	31.23	B: W:	76.12 143.12	2 43	143.12 4.27	12.09
Adjusted post test mean	41.85	40.85	31.89	B: W:	101.02 78.39	2 42	121.02 3.01	3.03

Table V shows the analyzed data on explosive power, the pre-test, post test and adjusted post test means of speed were (33.87, 31.01, 31.70)(40.87, 38.09, 31.23) (41.85, 40.85, 31.89) for the experimental group I,II,& III respectively. The obtained `F` ratio for pre-test 2.95,post test 12.09, and adjusted post test 3.03. The table value is 3.15 at .5 level of significant for the degree of freedom (2 and 43 and 2 and 42) hence the obtained `F` ratio adjusted post test were greater than the table `F` ratio. Therefore it is proved those plyometric training groups have been better the other two groups.

Table – VI
Computation of Analysis of co-variance on Cardio respiratory Endurance

	Experimental Group–I (Plyometric)	Experimental Group–II (Weight)	Control Group–III	Sources of variance	Sum of squares	Df	Mean squares	F-ratio
Pre-test mean	2487.5	2248.5	1985.5	B: W:	403073.3 7791150	2 43	201531.65 136818.95	1.5
Post-test mean	2567.5	2478.5	1980.5	B: W:	319740 1579240	2 43	159865 27706.1	5.77
Adjusted post test mean	2545.82	2506.32	1981.5	B: W:	65758.6 584310.2	2 42	32869.8 10241.2	3.2

Table VI shows the analyzed data on explosive power, the pre-test, post test and adjusted post test means of speed were (2487.5, 2248.5, 1985.5)(2567.5, 2478.5, 1980.5) (2545.82,2506.32, 1981.5) for the experimental group I,II,& III respectively. The obtained `F` ratio for pre-test 1.5,post test 5.77, and adjusted post test 3.2. The table value is 3.15 at .5 level of significant for the degree of freedom (2 and 43 and 2 and 42) hence the obtained `F` ratio adjusted post test were greater than the table `F` ratio. Therefore it is proved those plyometric training groups have been better the other two groups.

Table VII shows the analyzed data on explosive power, the pre-test, post test and adjusted post test means of speed were (21.40, 22.41, 21.03)(27.29, 28.37, 21.53) (25.33, 27.38,22.04) for the experimental group I,II,& III respectively. The obtained `F` ratio for pre-test 2.78,post test 6.78, and adjusted post test 3.21. The table value is 3.15 at .5 level of significant for the degree of freedom (2 and 43 and 2 and 42) hence the obtained `F` ratio adjusted post test were greater than the table `F` ratio. Therefore it is proved that Weight training groups have been better the other two groups.

Table – VII
Computation of Analysis of co-variance on Muscular Endurance

	Experimental Group–I (Plyometric)	Experimental Group–II (Weight)	Control Group–III	Sources of variance	Sum of squares	Df	Mean squares	F-ratio
Pre-test mean	21.40	22.41	21.03	B: W:	3.07 14.08	2 43	.98 .43	2.78
Post-test mean	27.29	28.37	21.53	B: W:	4.57 13.08	2 43	2.38 .85	6.78
Adjusted post test mean	25.33	27.38	22.04	B: W:	5.27 5.01	2 42	4.27 .61	3.21

Conclusions

Within the limitation of present study, the following conclusions were drawn:

Speed, Explosive power, Cardio-respiratory endurance and Muscular Endurance can be improved through plyometric and weight training as compared with controls.

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